CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION
81 Higuera Street, Suite 200
San Luis Obispo, California 93401-5427

CLEANUP OR ABATEMENT ORDER NO. 98-38

Concerning

Union Oil Company of California
at
Guadalupe Oil Field
San Luis Obispo County

Amended July 13, 1998

The California Regional Water Quality Control Board, Central Coast Region (hereafter "Board"), finds:

1. Union Oil Company of California, a California corporation (dba UNOCAL), has discharged petroleum to waters of the state at the Guadalupe Oil Field (hereafter "Field"). The Field covers over 2,300 acres within the Nipomo Dunes system in southern San Luis Obispo County and northern Santa Barbara County, about three miles west of the City of Guadalupe.

2. Discharge of petroleum and its chemical constituents into waters of the state is a violation of a prohibition contained in the Water Quality Control Plan, Central Coast Basin (hereafter "Basin Plan"), and creates, or threatens to create, a condition of pollution or nuisance.

3. Eugene R. Leroy Trust and Andre Leroy Trust own the property located at the far southwestern corner of San Luis Obispo County, assessor's parcel numbers 92-051-02, 92-041-001, 003, 004, 005 and 006, which they lease to UNOCAL pursuant to a written lease. UNOCAL operated the Field from 1951 to 1994. In addition to oil wells and pipelines, site infrastructure included tank batteries, surface impoundments, steam generators, weigh meter stations, a gas-compressor plant, roads, and electric power distribution equipment. UNOCAL's oil-producing operations ceased in 1994, and the Field is being prepared for abandonment.

4. Crude oil produced at the Field was extremely viscous, behaving like molasses in ambient conditions. UNOCAL used several methods to enhance oil recovery, including diluent mixing. Diluent is a refined petroleum product, similar in chemical composition to a mixture of diesel and kerosene. UNOCAL also used a minor amount of light crude oil trucked from nearby oil fields as a diluent. Diluent, other petroleum products and Field-related materials when improperly discharged or released resulted in pollution.

5. UNOCAL constructed and operated a diluent-distribution system, comprising storage tanks, pumps, and pipelines, throughout the Field. During Field operation, leaks developed in diluent pipes, pumps, and tanks, and spills occurred on the ground surface at many locations. Estimates of diluent amounts discharged or released to the environment (soil and water) range to over 8.5 million gallons.

6. Diluent released at the ground surface or in the near subsurface migrates quickly through the Field's sandy soils until reaching the water table. Where sufficient quantity was released, pools of floating diluent were formed on ground water.

7. The depth to ground water varies across the Field, depending on the height of the dunes. The first water-bearing unit, known as the dune sand aquifer, consists of medium sands and is approximately 10-feet thick. The dune sand aquifer is underlain by the confining unit, which consists of interbedded clays, silts, and sands

and is approximately 100-feet thick. Underlying the confining unit is the principal aquifer, a major water supply source, consisting of coarse sand and gravel.

8. Surface-water bodies on or bordering the Field include the Santa Maria River, the Santa Maria River Estuary, the Pacific Ocean, dune slack pools, and fresh-water marsh ponds A, B, and C. Attachment A identifies various surface-water bodies in and around the Field.

9. UNOCAL and state agencies are assessing soil and ground water conditions and have found more than 90 locations where diluent is found in soil at the ground water table. Of these more than 90 locations, at least four are very large plumes, each containing more than a million gallons of diluent, where diluent accumulates in monitoring wells at thicknesses of up to five feet. Diluent plumes dissolved in ground water extend from each location where diluent has accumulated at the water table. Diluent in ground water has been measured at concentrations up to 30 mg/L at locations across the Field. Diluent in soil samples has been measured at concentrations up to 170,000 mg/kg.

10. Pursuant to the Basin Plan, beneficial uses of ground water beneath the Field include municipal and domestic supply, agricultural supply, and industrial service supply. Beneficial uses of the Santa Maria River include municipal and domestic supply; agricultural supply; industrial service supply; ground water recharge; water contact recreation; non-contact water recreation; wildlife habitat; cold fresh water habitat; warm fresh water habitat; migration of aquatic organisms; rare, threatened or endangered species; fresh water replenishment; and commercial and sport fishing. Beneficial uses of the Santa Maria River Estuary include ground water recharge; water contact recreation; non-contact water recreation; wildlife habitat; warm fresh water habitat; migration of aquatic organisms; spawning, reproduction, and/or early development; preservation of biological habitats of special significance; rare, threatened or endangered species; estuarine habitat; fresh water replenishment; commercial and sport fishing; and shellfish harvesting. Beneficial uses of the dune slack ponds and fresh-water marsh ponds include ground water recharge; water contact recreation; non-contact water recreation; wildlife habitat; warm fresh water habitat; spawning, reproduction, and/or early development; rare, threatened or endangered species; and commercial and sport fishing.

11. Pursuant to the Basin Plan, ground waters shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses.

12. Pursuant to the Basin Plan, inland surface waters, enclosed bays, and estuaries shall be maintained free of toxic substances in concentrations that are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life.

13. Pursuant to the California Ocean Plan, beneficial uses of the ocean waters of the state include industrial water supply; water contact recreation; non-contact water recreation, including aesthetic enjoyment; navigation; commercial and sport fishing; mariculture; preservation and enhancement of Areas of Special Biological Significance; rare and endangered species; marine habitat; fish migration; fish spawning; and shellfish harvesting.

14. Pursuant to Water Code Section 13304 and State Water Resources Control Board ("State Board") Resolution No. 92-49, cleanup is required when pollutants are discharged and affect waters of the state.

15. Dissolved diluent can be transported in ground water and discharged to surface water. Diluent has been detected in surface-water bodies, including marsh ponds A, B, and C, the Santa Maria River, the Pacific Ocean, and the L11, M11, and P1 dune-slack pools, at concentrations up to 1.5 mg/L. Attachment B locates numerous areas impacted by Field releases, including all areas to be addressed in Phase I cleanup.

16. In addition to petroleum pollution at the Field, there are present or may be present other non-diluent contaminants, including, but not limited to, metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and semi-volatile organic compounds, resulting from UNOCAL's activities. Areas of the Field that will be disturbed by excavation or other activities require characterization with respect to these non-diluent contaminants before disturbance.

17. UNOCAL acknowledges its responsibility for Field-related pollutant discharges, is investigating the Field to determine pollution location and extent, has proposed a Field remediation project, and has agreed to the project described in this Order.

18. For the purposes of this Order, biosparging is defined as a process where air is introduced using blowers to the subsurface below the water table to promote the growth of aerobic microorganisms that will degrade dissolved diluent. Biosparging can be accomplished continuously or in a pulsed fashion through vertical or horizontal wells.

19. For the purposes of this Order, remediation by natural attenuation is defined as the natural physical, chemical, and biological processes that have a combined effect to reduce pollution concentration and mass. Remediation by natural attenuation is evaluated using measurements of pollution concentrations and other chemicals that indicate the amount and rate of any attenuation that is occurring.

20. For the purposes of this Order, active free-product removal by dual-pump extraction is defined as the process involving installing vertical extraction wells and pumping ground water with a submersible pump. A ground-water pump is placed at the bottom of the well. An oil-skimming pump is placed at the top of the liquid in the well. Dual-pump recovery provides both migration control and removal of free-phase diluent.

21. The proposed Order requires excavation of several areas with separate-phase diluent contamination. Soils excavated from these areas will be treated to remove petroleum before being used as backfill at other areas. Two methods will be used for soil treatment: thermal desorption and landfarming. Thermal desorption involves removing the petroleum from the soil by application of heat in a thermal desorption unit, powered by natural gas. Landfarming refers to a process where petroleum is removed from the soil by biological action. Contaminated soil will be placed in a treatment area, water and nutrients will be added, and the soil will be tilled to introduce oxygen. Landfarming will be conducted at Tank Battery 9.

22. The Field is a unique site. It is very large, over 2,300 acres, and as part of the Nipomo Dunes ecosystem contains many valuable biological resources. There are millions of gallons of dissolved-phase, separate-phase and free-phase diluent in underlying ground water and soils. Diluent and other pollutants have affected both ground water and surface water. The Final Environment Impact Report (defined in Finding No. 32) confirms that even if the most aggressive cleanup approach were implemented at the site (excavation of all separate-phase diluent plumes) water quality objectives in the shallow dune sand aquifer would not be achieved for many decades.

23. Because the Field is a unique site, the Board will accept a phased approach to regulating site cleanup. The fundamental goals of this phased approach are to protect surface waters (including the Santa Maria River and Estuary, Pacific Ocean, ponds and wetlands), protect the principal aquifer from future degradation, and reverse the current trend of continuing pollution of the shallow dune sand aquifer.

24. This Order establishes requirements for remediation work during Phase I. The fundamental goals of Phase I are to: 1) get cleanup started right away; 2) focus first on eliminating discharges of diluent to surface water (river, ocean, wetlands); 3) control dissolved-phase plumes that are known to be affecting or are an imminent threat to surface water; 4) perform field-scale pilot tests to identify effective cleanup methods; 5) continue monitoring of pollution migration to the principal aquifer and surface waters, migration of free-phase diluent,

cleanup effectiveness, resource impacts of cleanup work, and to gather other relevant information; and, 6) base future decisions on field experience.

25. Monitoring is a continuous process of periodic sampling throughout the Field. Monitoring is essential for both site characterization and remediation evaluation. Monitoring is needed over the long-term to assess water quality and other environmental impacts. It is also the means for detecting unexpected changes and new information that might require additional unanticipated cleanup action.

26. Site characterization is important to determine the degree of threat to surface water and regional water supply that is posed by the releases of diluent and other chemicals. Although a great deal of the dune sand aquifer investigation has been completed, more investigation is required to identify any impacts to the principal aquifer. Furthermore, assessment of discharges and threats to surface water is not complete. Site characterization work must be completed to identify the sources of diluent discharges to surface and ground water, and to assess non-diluent contamination. Site characterization information is needed to help select and design remediation methods.

27. The Board will consider subsequent orders to cover subsequent phases of remediation. Adoption of cleanup levels and requirements for the remediation of the rest of the Field are being deferred for reasons including the following: 1) site characterization and assessment are not complete (possible diluent impacts to the principal aquifer and the sources of diluent discharges to surface water are examples of phenomena still being investigated); 2) information from pilot testing to be conducted in Phase I is not yet available; 3) information regarding impacts of the cleanup process on natural resources can be best determined after field work is underway and is not yet available; and, 4) effectiveness of cleanup work to be implemented in Phase I can be best determined after the work is done. As the Board continues to learn more about the Field, and as experience and knowledge are gained through pilot testing and implementation of this first cleanup phase, the Board will have a better understanding of what will work best for site cleanup. Future decisions regarding remediation methods, cleanup levels and site locations not covered by Phase I work will be made as work proceeds and as knowledge and understanding increase.

28. At locations included in Phase I where the cleanup actions required by this Order do not meet the goals of Phase I, the Board may adopt subsequent orders to require additional cleanup. Subsequent orders may require additional cleanup as knowledge and understanding of the Field and contamination assessment increase.

29. The Board anticipates that UNOCAL will perform pilot studies to assist in evaluation of remediation methods. This Order sets forth a process for selecting and evaluating pilot studies. However, it does not approve or require implementation of any specific pilot studies.

30. Because timely complete permit applications are important for commencement of remediation work by Fall 1998, this Order requires UNOCAL to submit a comprehensive permit application plan.
31. High rainfall levels and releases from Twitchell Reservoir during early 1998, resulted in discharges of petroleum products and possibly other wastes from Field sumps to the river and ocean. Future wet-weather conditions could result in additional discharge of Field pollutants. In February and March 1998, UNOCAL implemented an emergency response to limit additional discharges. Part of this emergency response was the excavation of plume A2A South. This Order contains requirements for UNOCAL to identify all oil-field sumps and other waste management units and to remove sumps and other waste management units in a specified area where they pose a high risk of discharge to surface water, and to take responsibility to prevent similar discharges in the future.

32. The County of San Luis Obispo has prepared a Final Environmental Impact Report (FEIR) that evaluates UNOCAL's proposed Field remediation project along with various alternatives. The County, as lead agency, certified the FEIR on March 26, 1998. The Board, as a responsible agency, adopted Resolution No. 98-04

that contains findings of changes in the project to mitigate significant environmental impacts of Phase I remediation work and a mitigation monitoring plan. These findings are limited to the portion of the project approved by the Board and to mitigation measures that are within the Board's jurisdiction.

IT IS HEREBY ORDERED, pursuant to sections 13267 and 13304 of the California Water Code, that UNOCAL, its agents or assigns, shall remove free product and clean up degraded soil and ground water underlying the Guadalupe Oil Field, as follows:

I. Phase I - Soil and Ground Water Cleanup

A. Excavation

1. The following excavation work shall commence by the date specified and shall continue without interruption until the Executive Officer determines that the excavation work has complied with the excavation standards specified in Ordering Paragraph I.A.2., below:

a) Plume areas B12 (partial), C12, L11 (partial), TB1 N, TB1 M, TB1 S: UNOCAL shall commence excavation of separate-phase diluent by fourth quarter 1998, and shall complete excavation in fourth quarter 1999.

b) Plume areas 5X and A2A N: UNOCAL shall commence excavation of separate-phase diluent by fourth quarter 1999, and shall complete excavation in fourth quarter 2000.

c) Plume areas M2 and M4 (partial): UNOCAL shall commence excavation of separate-phase diluent by second quarter 2000, and shall complete excavation in fourth quarter 2000.

d) Plume areas A5A and C8: UNOCAL shall commence excavation of separate-phase diluent by fourth quarter 2000, and shall complete excavation in first quarter 2001.

e) Plume areas B2-3 and N12: UNOCAL shall commence excavation of separate-phase diluent by second quarter 2001, and shall complete excavation in third quarter 2001.

f) Plume areas C7 S and B6: UNOCAL shall commence excavation of separate-phase diluent by fourth quarter 2001, and shall complete excavation in second quarter 2002.

g) Plume Area C2: If it is determined that excavation is required after TB1 excavations are complete, UNOCAL shall commence excavation of separate-phase diluent at C2 by fourth quarter 2001, and shall complete excavation in second quarter 2002.

Note: Temporary interruption may be approved by the Executive Officer in advance or pursuant to the requirements for authorizing unavoidable delays as described in Ordering Paragraph IX., below.

2. Excavation of a specific plume will be considered complete when the following criteria have been met and backfilling is complete:

a) The mean concentration of soil samples collected at the bottom of the excavation shall not exceed 700 mg/kg total petroleum hydrocarbons. Concentrations of no more than 5% of samples collected at the bottom of the excavation shall exceed 1,000 mg/kg total petroleum hydrocarbons.

b) Sheet pile shall be installed at least 15 feet outside the 1,000-mg/kg TPH contour as interpreted using data collected from soil borings. In exception to this criterion, sheet pile for plumes C12, C8N, B6, M2 and TB1S shall be installed approximately five to ten feet outside the 1,000 mg/kg TPH contour on one side of each plume. The exact limits of sheet pile placement under the exception for C12, C8N, B6, M2 and TB1S shall be approved by the Executive Officer based on field information.

c) Samples of the excavation bottom shall be collected at 25-feet centers, or as directed in the field by Board staff.

d) If concentrations in more than 5% of samples collected at the bottom of the excavation exceed 1,000 mg/kg total petroleum hydrocarbons after UNOCAL has removed as much degraded soil as reasonably practicable, the Executive Officer, with the advice of other interested agencies, will decide if further excavation or other cleanup actions must be conducted, or if the excavation may be backfilled. The Executive Officer will decide within a reasonable time taking into account, among other things, project efficiencies.

e) All Field-related sump material encountered in diluent-plume excavations shall be removed and properly disposed.

f) Compounds designed to enhance biological degradation of remaining hydrocarbons, including nutrients and other appropriate additives, shall be added to excavations before backfilling. The amounts and types of such compounds to be added shall be determined on a general site-wide basis by UNOCAL and approved by Board staff before October 1, 1998.

g) UNOCAL shall conduct post-excavation ground-water monitoring. Monitoring wells destroyed due to the excavation shall be replaced if the Executive Officer determines they are needed to establish a sufficient monitoring network.

h) The intent of these criteria is to require excavations that will successfully stop discharges of diluent to surface water within a short time frame with as little impact as possible to adjacent areas and resources. These criteria are not final cleanup levels. After excavation, the Board may require evidence that natural degradation of remaining hydrocarbons is occurring, especially in instances where hydrocarbons at concentrations exceeding 700 mg/kg TPH were left in place. No further excavation shall be required in any area that has been excavated in compliance with these excavation standards except in those areas where only partial excavation has been required (e.g., L11, M4, B12).

3. UNOCAL shall meet the following milestones with respect to excavation at the 5X plume:

a) By June 1, 1998, UNOCAL shall submit a plan to complete characterization of the vertical and lateral extent of degradation. The plan shall also propose sampling for non-diluent compounds to comply with paragraph I.A.5, below.

b) By August 1, 1998, UNOCAL shall submit an interim report detailing prospective sources of sand backfill and sheetpile, and the status of Unocal's efforts to procure the sand and sheetpile necessary to begin excavation in fourth quarter 1999.

c) By October 1, 1998, UNOCAL shall commence assessment work in accordance with the assessment plan, as approved or modified by the Executive Officer.

d) By December 31, 1998, UNOCAL shall submit a report of the results of the assessment.

e) By April 1, 1999, UNOCAL shall submit a draft excavation engineering plan. In addition to any other elements necessary to implement the project, this plan shall include a sand budget and stockpiling plan, a permitting plan, a treatment plan including air-pollution considerations, and a sheet pile plan.

4. UNOCAL shall submit to the Board an excavation engineering plan at least 45 days prior to commencing excavation at any location.

5. Before commencing excavation or other soil disturbance at any location, UNOCAL shall submit a plan to the Board to characterize the overburden, affected soils, and ground water for the presence of non-diluent contaminants, including, but not limited to, Title 22 metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and semi-volatile organic compounds, at that location. The Executive Officer, with assistance of other agencies as required, shall review and approve the plan before it is implemented. The plan shall be implemented to the satisfaction of the Executive Officer before any soil disturbance occurs.

B. Biosparging

1. Biosparging systems shall be installed and in operation at the following sites by March 31, 1999, or as soon after that date as excavation activities allow: TB8, B12, L11.
2. A biosparging system shall be installed and in operation at plume area M4 by December 31, 2000, or as soon after that date as excavation activities allow.
3. A biosparging system shall be installed and in operation at plume area D8 by March 31, 2001, or as soon after that date as excavation activities allow.
4. Biosparging shall continue without interruption until authorized to cease by the Executive Officer. Temporary interruption may be authorized in advance by the Executive Officer or pursuant to the requirements for authorizing unavoidable delays (see Ordering Paragraph IX., below).
5. By September 1, 1998, UNOCAL shall submit a proposed biosparging monitoring plan for consideration by the Executive Officer. Monitoring shall be implemented as directed by the Executive Officer.

C. Remediation by Natural Attenuation

1. UNOCAL shall monitor and evaluate natural attenuation of diluent at C2A, F14, M11, M13A, and TB9 S. Monitoring data shall be reported in regular monitoring reports, as required by Ordering Paragraph IV., below.
2. By September 1, 1998, UNOCAL shall submit a natural attenuation monitoring plan for consideration by the Executive Officer. Monitoring shall be implemented as directed by the Executive Officer.

D. Active Free-Product Recovery

1. Compressor Plant: UNOCAL shall install and begin operation of at least five dual-pump product-recovery wells at the leading edge of the free-phase plume by March 31, 1999.
2. Diluent Tanks: UNOCAL shall install and begin operation of at least eight dual-pump product-recovery wells at the center of the free-phase plume by March 31, 1999.
3. TB 9: UNOCAL shall install and begin operation of at least five dual-pump product-recovery wells at the leading edge of the free-phase plume by March 31, 1999.

4. Active free-product recovery shall continue without interruption until authorized by the Executive Officer. Temporary interruption may be authorized in advance by the Executive Officer or pursuant to the requirements for authorizing unavoidable delays (see Ordering Paragraph VIII., below).
5. By July 1, 1998, UNOCAL shall submit an active free-product recovery monitoring plan for consideration by the Executive Officer. Monitoring shall be implemented as directed by the Executive Officer.

E. Passive Free-Product Recovery

1. By July 1, 1998, UNOCAL shall begin recovery of free product by passive skimming, bailing, or another method from existing monitoring wells that contain at least one-eighth of an inch of product. Such recovery shall occur at the following locations, at a minimum: compressor plant, diluent tanks, E6, F5, G4A, H13, H5, I5, J5A W, J8, K5, M1, M3, N1A, N4, N7, and TB 9.
2. Passive free-product recovery shall continue without interruption until authorized by the Executive Officer or until the thickness of floating product in the well is less that one-eighth of an inch. While conducting tests of product-recovery technologies, UNOCAL may interrupt recovery at specific wells if static conditions at those wells are required to determine the effectiveness of the technology being tested. Other temporary interruptions may be authorized in advance by the Executive Officer or pursuant to the requirements for authorizing unavoidable delays (see Ordering Paragraph IX. below).
3. By June 1, 1998, UNOCAL shall submit a passive free-product recovery implementation and monitoring plan for consideration by the Executive Officer. Recovery and monitoring shall be implemented as directed by the Executive Officer.

F. Other Cleanup Activities

1. Plume Area A8: UNOCAL shall adequately characterize separate and dissolved-phase plumes to the satisfaction of the Executive Officer by October 1, 1998. If this characterization shows there is no discharge of diluent to surface water, UNOCAL shall implement remediation by natural attenuation. Otherwise, UNOCAL shall implement active control of dissolved diluent by a method acceptable to the Executive Officer by March 1, 1999.
2. Plume Areas B5A N, C7 N, C7 SE, P13: UNOCAL shall adequately characterize separate-phase plumes by March 1, 1999, and submit cleanup plans to the Board by October 1, 1999.
3. Plume Area O13: Unocal shall adequately characterize separate-phase and dissolved diluent to the satisfaction of the Executive Officer by December 15, 1998, and submit a cleanup plan to the Board by March 1, 1999.
4. Plume Area B11: UNOCAL shall adequately characterize the separate-phase diluent plume to the satisfaction of the Executive Officer by March 1, 1999. If characterization indicates a threat to surface water, either excavation or biosparging shall be implemented. Associated cleanup shall begin by October 1, 2000, and shall continue without interruption until authorized by the Executive Officer. Temporary interruption may be authorized in advance by the Executive Officer or pursuant to the requirements for authorizing unavoidable delays (see Ordering Paragraph IX., below).
5. The results of characterization activities, including recommended actions, shall be reported to the Executive Officer by UNOCAL no later than the dates identified in F.1, F.2, and F.3, above.

II. Sumps and Other Waste Management Units

A. UNOCAL shall submit to the Executive Officer by August 1, 1998, a report regarding all sumps and other waste management units (including but not limited to trenches, ditches or other areas where petroleum products or other oil-field waste were disposed or placed during oil-development and production operations) located on the site between the ocean and the "B" road, south of well-pad A8, and north of the river channel. This area is shown on the map attached to this Order as Attachment C. The report must clearly locate each sump and waste management unit and determine the type, area and depth of waste placement. The report must propose action that will remove threats of discharge to surface water from these sumps and waste management units. UNOCAL shall remove or remediate any sumps or waste management units as directed by the Executive Officer. Removal and remediation work in accordance with a plan approved by the Executive Officer shall commence no later than Fall 1998.

B. The plan submitted shall include a proposal to monitor and report waste removal activities (waste type, volume, handling, treatment and disposal). Quarterly monitoring reports shall be submitted to the Executive Officer according to Ordering Paragraph IV below.

III. Permit Application

A. UNOCAL shall submit a comprehensive permit application plan to the Board by May 1, 1998. This plan shall list all local, state and federal permits that UNOCAL must or may have to acquire to begin implementing remediation work within the times required by this Order. The plan shall list the date by which UNOCAL will apply for each permit. UNOCAL shall apply for permits in accordance with this plan.

B. UNOCAL shall timely apply for all permits as necessary to complete, and so as not to delay, actions directed by this Order to be commenced in Fall 1998.

C. UNOCAL shall make good-faith efforts to obtain any other permits required to commence the actions required in this Order by the dates specified in this Order.

IV. Monitoring and Reporting

A. Quarterly, UNOCAL shall submit to the Board reports of completed cleanup activities and routine monitoring, including implementation of mitigation measures specified in Resolution No. 98-04. The reports shall detail the actions taken, sampling results, amounts of petroleum removed, the disposition of materials removed, and recommendations for additional actions based on data collected during the reporting period. Reports shall be submitted by the first day of the second month following the end of the quarter (i.e., 1st Quarter Report [Jan-Mar] is due by May 1; 2nd Quarter Report [Apr-Jun] is due by August 1; 3rd Quarter Report [Jul-Sep] is due November 1; and, 4th Quarter Report [Oct-Dec] is due by February 1).

B. UNOCAL shall comply with Levine Fricke Recon's February 20, 1998, "Water Monitoring Plan," as amended and approved by the Executive Officer, including the associated quarterly monitoring. The plan is hereby incorporated by reference.

C. UNOCAL shall submit Phase I soil and ground-water monitoring data and reports as required by Ordering Paragraphs I., II., and III., above.

D. The Executive Officer may request reasonable changes to the Water Monitoring Plan, based on review of collected data, new site-characterization information or a change in Field conditions. The current mediation process may be used (if it exists) to guide monitoring changes.

V. Soil Management Plan

A. UNOCAL has proposed to treat petroleum-affected soil using thermal desorption and landfarming at Tank Battery 9. Unless exempt from regulation under Title 23 California Code of Regulations Chapter 15 or Title 27 California Code of Regulations Division 2, UNOCAL shall apply for waste discharge requirements or a waiver of waste discharge requirements for landfarming and thermal desorption activities.

B. Landfarming and thermal desorption activities shall conform with appropriate waste discharge requirements issued by the Board and any monitoring directed by the Executive Officer.

VI. Waste Disposal

A. Wastes removed from the Field, including soil, petroleum, and water, shall be disposed of in accordance with all applicable laws and regulations.

VII. Pilot Studies

A. The goal of the pilot studies is to identify ways to remove separate-phase diluent without excavation.

B. To facilitate the implementation of the pilot-test program, a panel of three experts (one chosen by UNOCAL, one by the Executive Officer, with those two picking a third) will be selected within 90 days of court approval of the settlement agreement. Concur, Inc., will act as facilitator for the panel discussions. If Concur does not accept this role, UNOCAL and the Executive Officer will select another facilitator that they both agree to.

C. No more than three methods will be pilot tested in this first round in addition to the bioremediation and dual-phase pumping pilot tests UNOCAL is already doing or has agreed to do as part of the remediation process. As the first step in identifying the three remedial methods to be pilot tested, the panel will review UNOCAL's alternatives studies, (e.g., the Remedial Action Plan and the Feasibility Study), the FEIR (including UNOCAL's comments thereon), and available literature to identify methods of separate-phase diluent removal that are preferable to excavation on any basis. Within six months of the selection of the third member of the panel or as otherwise agreed by Unocal and the Executive Officer, the panel will rank each of the methods based upon effectiveness, cost, and short-term and long-term environmental impact and make a recommendation as to the three methods to be pilot tested. The Board and UNOCAL agree that steam/hot-water injection will be included among the methods to be considered by the panel.

D. The Executive Officer will consider the panel's recommendations and tentatively select method(s) to be pilot tested. The Executive Officer will notify UNOCAL in writing of his tentative decision. If UNOCAL disagrees with the tentative selection, UNOCAL may invoke dispute resolution. Representatives of UNOCAL and the Board will meet and attempt to reach agreement, with the assistance of the facilitator identified in Ordering Paragraph VII.B., above. If there is no agreement within six months after the panel makes its recommendation or as

otherwise agreed by the parties, the Executive Officer or Board will make the final decision regarding which pilot tests will be carried out. UNOCAL reserves whatever rights it has to appeal the Executive Officer's decision.

E. UNOCAL, in consultation with Board staff, the panel of experts and the proponent of the method, will design the pilot study. The pilot study design must be acceptable to the Executive Officer.

F. To the extent feasible, the proponent of the method will implement the pilot study and submit a report to UNOCAL, the panel of experts, and the Board, reporting the results of the pilot test. The panel of experts, with input from the Board and UNOCAL, will review the report and provide its recommendation regarding further actions based on the pilot study results within six month after receiving the pilot test report. The information obtained from the pilot studies and the panel's recommendation will be part of the record to be considered by the Board in accordance with State Board Resolution No. 92-49 (and subsequent amendments thereto) in making any decisions regarding Phase I remediation or subsequent remediation. UNOCAL reserves whatever rights it has to appeal a Board decision based in whole or in part on the results of the pilot studies.

G. Further California Environmental Quality Act studies will not be required for any Board action regarding a pilot study unless required by California Environmental Quality Act Guidelines Section 15162. The Board may make appropriate findings as required by California Environmental Quality Act Guidelines Section 15091.

H. UNOCAL has agreed to at least one more round of pilot studies at the end of the first five-year pilot-test period. The number of methods to be tested in the second round of pilot studies will be limited to a reasonable number. The panel described in subsection B., above, shall be available to facilitate the performance of this second round of pilot tests in the same manner as described in subsections C. through F., above. The Board's dispute resolution and appeal process described in subsections C. through F., above, will also be applicable to the second round of pilot testing. Nothing in this agreement is intended to limit the ability of the Board to require additional rounds of pilot testing after the second round of pilot testing. UNOCAL specifically reserves whatever rights it has to appeal a decision of the Board to require more pilot tests beyond the initial round of pilot tests.

VIII. Implementation of Mitigation Measures pursuant to California Environmental Quality Act

A. UNOCAL shall incorporate into the work required by this Order the following mitigation measures, identified in the FEIR and set forth in Resolution No. 98-04:

1. Marine Water Quality: MWQ-1, MWQ-2, MWQ-3 as modified, and MWQ-4 as modified.
2. Marine Biology: MB-1 and MB-2.
3. Water Quality: W-1 as modified, W-2 as modified, W-3 as modified, and W-4 through W-37, inclusive.
4. Onshore Biological Resources: V3(a).

B. UNOCAL shall implement additional mitigation measures identified in permits issued by other agencies, as necessary to complete, and so as not to delay, Phase I cleanup directed by this Order.

IX. Executive Officer approval is not needed for an interruption of work for five working days or less. Interruption of work for more than five working days may be authorized by the Executive Officer for a cause beyond the reasonable control of UNOCAL. Notification shall be in writing, including an explanation for the interruption, the reason the interruption is beyond the reasonable control of UNOCAL, and the approximate interruption timing. UNOCAL must notify the Executive Officer at least five days prior to anticipated work interruption or as soon as possible if five days notice is not practicable. If the Executive Officer disagrees with UNOCAL's request, he shall notify UNOCAL orally within one week of receipt of the written request. If UNOCAL requests, the Executive Officer will provide a written explanation of reasons for rejecting the delay within one week after UNOCAL asks for the written explanation. If the Executive Officer fails to respond to the request within the time permitted, the request for a delay up to 30 days is deemed approved. Any delay in excess of 30 days cannot be approved without the explicit agreement of the Executive Officer.

X. Compliance with any of the deadlines set forth in this Order shall be excused to the extent that such non-compliance arises from a cause beyond the reasonable control of UNOCAL, including, but not limited to, denial of access by land owners, weather or natural disasters, or unanticipated increases in the scope of excavation which prohibit timely completion of the required work. To request relief from a compliance deadline based on causes beyond its reasonable control, UNOCAL shall file a written notification with the Executive Officer as soon as practicable upon discovery of the cause and no later that 30 days after the discovery of the cause or 90 days before the deadline, whichever is earlier, explaining the reason for the non-compliance and why the reason was beyond UNOCAL's reasonable control and requesting an extension of the deadline to a date that can reasonably be achieved. If the Executive Officer disagrees with UNOCAL's request for an extension of the deadline, he shall notify UNOCAL orally within one week of receipt of the written notification. If UNOCAL requests, the Executive Officer will provide a written explanation of reasons for rejecting the requested new deadline within one week after UNOCAL asks for the written explanation. If the Executive Officer fails to respond to the request within the time permitted, the request for an extension of the deadline up to 30 days is deemed approved. Any delay in excess of 30 days cannot be approved without the explicit agreement of the Executive Officer.

XI. The intent of this Order is to require Phase I remedial actions that prevent discharges of diluent to surface water. If the actions required by this Order fail to meet that goal to the satisfaction of the Executive Officer, the Board may require additional corrective action as part of Phase I of the remediation project. Until all petroleum pollution and associated waste materials have been properly removed, treated, and disposed to the Board's satisfaction, UNOCAL remains responsible for any release to the environment and responsible for protection of resources and species impacted or threatened by Field-related materials. This Order does not limit the Board's discretion to require what it deems appropriate for future cleanup.

All technical and monitoring reports required in conjunction with this Order are required pursuant to Sections 13267 and 13304 of the California Water Code. Technical reports and plans shall be signed and stamped by an appropriately qualified engineer or geologist licensed in the State of California.

FAILURE TO COMPLY WITH THE PROVISIONS OF THIS ORDER MAY SUBJECT YOU TO FURTHER ENFORCEMENT ACTION, INCLUDING, BUT NOT LIMITED TO, ASSESSMENT OF CIVIL LIABILITY UNDER SECTIONS 13268 AND 13350 OF THE WATER CODE AND REFERRAL TO THE DISTRICT ATTORNEY OR ATTORNEY GENERAL FOR INJUNCTIVE RELIEF AND CIVIL OR CRIMINAL LIABILITY.

Executive Officer

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Date